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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/560,447	12/12/2005	Paulus Martinus Catharina Hesen	NL03 0692 US1	3088
65913	7590	03/31/2010		
NXP, B.V. NXP INTELLECTUAL PROPERTY & LICENSING M/S41-SJ 1109 MCKAY DRIVE SAN JOSE, CA 95131			EXAMINER CHHAYA, SWAPNEEL	
			ART UNIT 2895	PAPER NUMBER
			NOTIFICATION DATE 03/31/2010	DELIVERY MODE ELECTRONIC

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/560,447
Filing Date: December 12, 2005
Appellant(s): HESEN ET AL.

Robert J. Crawford
Eric J. Curtin
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 11/30/2009 appealing from the Office action mailed 6/26/2009.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6975022

Sakamoto

2-26

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 3-7, 9, 10, 11, 12, 13, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Coldren (U.S. Patent 4252864).

Regarding claim 1.

lead frame comprising:

a frame; having a

first and a second connection conductors respectively connected to the frame and

provided with a non-engaging end portion within a perimeter of the frame, the end

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portion of the second connection conductor being positioned adjacent an extension of the first connection conductor, the second connection conductor configured to bend along a bending axis which is at an oblique angle with respect to the longitudinal axis of the end portion to position the end portion of the second connection conductor opposite the first connection conductor to secure, a semiconductor element (16) between said connection conductors. (Fig. 1-5 column 3 lines 15-20 55-67 column 4 lines 1-10)

Regarding claim 2. A lead frame as claimed in claim 1, characterized in that the end portion of the second connection conductor (72') is positioned has been brought to a position opposite the position of the semiconductor element and bent by bending along a bending axis which is at an oblique angle with respect to the longitudinal axis of the end portion. (Fig. 4-5 column 4 lines 1-10)

Regarding claim 3.

A method of manufacturing a semiconductor

device comprising the steps of:

- providing a semiconductor element having a first and a second electric connection region which connection regions are situated at opposite sides of the semiconductor element (Fig. 1-5 column 4 lines 1-65)

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-providing a lead frame having first and second connection conductors respectively connected to a frame and having freely extending end portions the end portion of the second conductor being bent along a bending axis that is at an oblique angle with respect to a longitudinal axis of the end portion and extending over the end portion of (new matter)the first conductor (Fig. 1-5)

- fitting the semiconductor element between the freely extending end portions of the first connection conductor and the second connection conductor using connection means are used to make electro-conductive connections between the connection regions and the end portions. (Fig. 1-5 column 4 lines 1-65)

Regarding claim 4.

A method of manufacturing a semiconductor device comprising
the steps of:

- providing a semiconductor element (16) having a first and a second electric connection region which connection regions are situated on opposite sides of the semiconductor element; (Fig. 1 column 3 lines 1-15)

- providing a lead frame having a frame with a first and a second connection conductor which connection conductors are each connected to the frame and provided with an exposed freely extending end portion; (Fig. 4 column 3 lines 25-30)

- applying the semiconductor element to the end portion of the first connection conductor an electro-conductive connection between the first connection region and the end portion being made by using a connection means; (Fig. 1)

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- moving the end portion of the second connection conductor to a position outside the plane of the frame and opposite a location for the second connection region of the semiconductor element (Fig. 4-5)

- making an electro-conductive connection between the second connection region and the end portion of the second connection conductor by using a connection means, characterized in that the end portion of the second connection conductor within the frame is positioned outside the extension of the first connection conductor and is brought to a position opposite the position for the second connection region of the semiconductor element by bending along a bending axis which is at an oblique angle with respect to the longitudinal axis of the end portion. (Fig. 4-5)

Regarding claim 5.

A method as claimed in claim 4,

characterized in that the end of the end portion of the second connection conductor is bent through approximately 90 degrees along the bending axis out of the plane of the frame, and the end of the end portion is bent, along a further bending axis extending substantially parallel to the bending axis and at a distance therefrom corresponding approximately to the thickness of the semiconductor element, through an angle of approximately 90 degrees to the position of the semiconductor element (Fig. 3-5)

Regarding claim 6.

A method as claimed in claim 5,

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characterized in that the end portion of the second connection conductor is bent along the further bending axis or along another bending axis in such a manner that said end portion extends obliquely in at least one direction with respect to the end portion of the first connection conductor which contains the position for the semiconductor element (Fig. 3-5)

Regarding claim 7.

A method as claimed in claim 4, characterized in that the semiconductor element is slid between the connection conductors after the end portion of the second connection conductor has been bent to a position opposite the location for the second connection region of the semiconductor element and opposite the end portion of the first connection conductor, the element being clamped between the connection conductors. (column 4 lines 10-25)

Regarding claim 9.

A method as claimed in claim 3, characterized in that before the semiconductor element is slid between the connection conductors, the end portion of the first connection conductor is maintained in a depressed position by means of a pressure member, until the semiconductor element has been slid between the connection conductors. (column 4 lines 10-25)

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Regarding claim 10.

A device for manufacturing a semiconductor device the device comprising:

- a transport mechanism (2) for a lead frame with at least two freely extending connection conductors (Fig. 1-5 column 3 lines 1-25)
- positioning means for positioning a semiconductor element (Fig. 1-5 column 4 lines 10-25)
- pusher means for pushing the semiconductor element in between the two connection conductors of which one is bent to a position above the position of the other one (Fig. 1-5 column 4 lines 10-25, 50-60),
- means for bending an end portion of at least one of the connection conductors along a bending axis which makes an oblique angle with the longitudinal axis of the end portion. (Fig. 4-5 column 4 lines 10-35)

Regarding claim 11.

A device as claimed in claim 10,
which further comprises means for bending an end portion of at least one of the connection conductors along a bending axis which makes an oblique angle with the longitudinal axis of the end portion. (Fig. 4-5 column 4 lines 10-35)

Regarding claim 12.

A device as claimed in claim 10,
characterized in that it comprises pressure means for pressing downward one of the

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conductor tracks during the pushing against the semiconductor element (Fig. 1-5 column 2 lines 55-65)

Regarding claim 13.

A semiconductor device comprising:

- a semiconductor element which is provided with a first and a second electric connection region, which connection regions are situated on opposite sides of the semiconductor element (Fig. 1-5 column 3 lines 5-20)
 - a first connection conductor having a contact, and facing away therefrom, an end portion which is electro-conductively connected to the first connection region (Fig. 1-5 column 3 lines 15-20)
 - a second connection conductor having a contact, and facing away therefrom, an end portion which is bent along a bending axis which is at an oblique angle with respect to the longitudinal axis of the end portion, such that the end portion is situated opposite the second electric connection region, with which it is electro-conductively connected, while the contact is situated in the same plane as the contact of the first connection conductor, the end portion having a further bent region in contact with the second electric connection region and having a length that corresponds approximately to the thickness of the semiconductor element (Fig. 1-5 column 3 lines 45-65 column 4 lines 1-30)
- an isolating envelope which leaves contacts facing way from the end portions of the connection conductors uncovered. (Fig. 1)

Regarding claim 15. A semiconductor device as claimed in claim 13, characterized in that:

- the semiconductor element is a semiconductor transistor with a third connection region (Fig. 1-5 column 3 lines 45-65 column 4 lines 1-30)
- a third connection conductor is present, which has a contact, and facing away therefrom, an end portion which is bent along a bending axis which is at an oblique angle with respect to the longitudinal axis of the end portion, such that the end portion is situated opposite the third electric connection region, with which it is electro-conductively connected, while the contact is situated in the same plane as the contact of the first connection conductor;(Fig. 1-5 column 3 lines 45-65)
- the second and the third connection conductor are situated on either side of the first connection conductor (Fig. 1-5 column 3 lines)

Regarding claim 16, A semiconductor device as claimed in claim 13, or a lead frame as claimed in claim 1, characterized in that the first connection conductor is provided with a hole at a distance from the position for the semiconductor element. (Fig. 5)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Coldren (U.S. Patent 4252864) as applied to claim 13 above in view of Sakamoto et al. (U.S. Patent 6975022).

Regarding claim 8. Coldren discloses:

A method as claimed in claim 3, characterized in that

- a lead frame is chosen in which the first connection conductor is provided with a hole at a distance from the position of the semiconductor element (Fig. 5)

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Coldren discloses the claim except for the semiconductor element being placed on the hole and fixed by means of a suction device and the pushing means.

Sakamoto discloses:

- the semiconductor element (15) is placed on the hole and fixed by means of a suction device (24, V) present below the hole, after which the semiconductor element is pushed between the connection conductors by means of a pusher member (Fig. 1-5-11 column 8 lines 30-60 column 9 lines 10-15)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to implement a suction device, and a pusher member as taught by Sakamoto, since *Sakamoto* states at column 8 lines 30-60 that such a modification would aid in mounting and fixing the semiconducting device.

Regarding claim 14.

A semiconductor device as claimed in claim 13, characterized in that:

Sakamoto discloses:

- the semiconductor element is a semiconductor diode (Fig. 1-5-11 column 12 lines 9-11)

Coldren discloses:

- The second connection conductor is u-shaped or j-shaped prior to bending (Fig. 4)

(and

- the contacts of the connection conductors are in line with one another (Fig. 1-5)

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Coldren in view of Sakamoto discloses the claimed invention except for the oblique angle range of the lead frame. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use such a range, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

(10) Response to Argument

A.

The § 102(b) Rejections Have Failed To Establish Correspondence.

As applicable to all claim rejections under § 102(b), the Office Action has failed to show or explain correspondence to multiple claim limitations, contrary to the requirements of § 102(b). For example, the Office Action has relied upon vague citations to figures as allegedly corresponding to entire claims, yet provides no explanation whatsoever as to where correspondence lies in the cited reference and fails to address (or show correspondence to) every limitation. Instead of explaining how the cited '864 reference corresponds as required under the M.P.E.P. and § 102(b), the Office Action has simply repeated Appellant's claim limitations and followed the repeated limitations with unexplained citations. Appellant has reviewed the cited portions of the '864 reference and has been unable to identify any correspondence as asserted or otherwise. Accordingly, all § 102(b) rejections are improper and should be removed. The following sections separately address lack of correspondence in various claims as referenced.

1.

The Office Action Has Failed To Establish Correspondence To Multiple Claim Limitations In Claims 1-7~ 9-13 and 15.

As consistent with Appellant's traversals of record, the '864 reference fails to disclose various claim limitations including those directed to a lead frame having non- engaging end portions that electrically connect to opposite sides of a semiconductor element (see, e.g., independent claims 1 and 3), as well as to various other characteristics of the claimed lead frame. For example, the cited portions of the '864 reference describe a contact on a semiconductor element (chip) itself instead of a lead frame (see "contact area 24" in Figure 3), and fail to disclose a lead frame having connection conductors that are located within an outer perimeter of the frame, as well as connectors that respectively freely extend in order to secure a semiconductor element.

The examiner would like to note that Fig. 1 as well as the abstract disclose and explain a lead frame, the contact area is cited in order to fulfill the limitation of claim 3 which states "providing a semiconductor element having a first and second electric connection region which connection regions are situated at opposite sides of the semiconductor

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element. Furthermore, an explanation as to how this limitation is fulfilled has been disclosed in the final rejection. Fig. 1 shows a lead frame with a perimeter (30,32) and the connection conductors are clearly located with the perimeter of the lead frame, and the connection conductors freely extend, since in Figure 4 to Figure 5, the connection conductors are bent, they would not be able to bend if they did not freely extend. The examiner would like to further note that the entire reference of '864 is devoted to disclosing a lead frame.

The alleged "connectors" cited in the Office Action are neither freely-extending or within a perimeter. Referring to Figure 4 (copied below), the cited connectors (see supporting region 34 of FIG. 4) are fixed at both ends. Accordingly, the Examiner's assertions of record (as further emphasized in the Advisory Action), that the '864 reference indeed discloses a "lead frame," stop far short of establishing correspondence under § 102 to limitations directed to specific aspects of such a lead frame, to which no correspondence has been established.

As stated above, the perimeter in the '864 reference is (30,32) in Figs. 1-5, and the conductors are not connected at both ends as alleged by the appellant, for example, in figure 1, the connectors are disconnected entirely from all fixed ends, in figures 4-5, the connectors (72',74',60',62') are disconnected on at least one end so that they can be bent at an oblique angle in order to secure a chip, if they were not freely extending, they would not be able to be configured to secure anything.

Specifically, the asserted "connection conductors" (e.g., 74) of the '864 reference are not within a perimeter of any lead frame, and the lower supporting region 34 is fixed at both ends. This is also consistent with Figure 5, copied below for convenience. Referring again to Figure 4, the central portion of the lead frame (e.g., 42', 78) is engaged to carrier strips 30 and 32 at both ends of the lead frame, thus fixing the asserted lead frame. In addition, the connection conductors 74' clearly extend away from the asserted lead frame and continue to be so arranged after engagement as shown in Figure 5.

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Figure 1 of the '864 reference clearly shows the supporting region becoming disengaged from carrier strips. Furthermore, it is unclear what the appellant is referring to with regards to Fig. 5, as the connection conductors (72, 60) are not extending away.

Accordingly, the cited portions of the '864 reference, including Figures 4 and 5 and their corresponding discussion, fail to correspond to claim limitations as asserted, including those directed to connectors having a "non-engaging end portion within a perimeter of the frame" (see independent claim 1). In addition, while end portions 62 and 74 are not engaged, they both connect to the same side of a chip (see, e.g., Figure 5 above, showing end portion 62 extending into an opening 70 in end portion 74). Thus, there is no disclosure of two end portions that respectively engage opposite sides of a semiconductor element as claimed.

The § 102(b) rejections of claims 1-7, 9-13 and 15 are thus improper and should be reversed.

This argument has a logical fallacy in that if the two end portions (62 and 74) connected to the same side of the chip(i.e. the left side) then they would either connect to the same contact point or connect to each other, furthermore, it is unclear from appellant's claims whether the two end portions are supposed to connect to opposite sides of the chip as in top and bottom or left and right. Looking at Fig. 3 of the '864 reference, as appellant argued before, the examiner has brought applicant's attention to the contact points of the chip, and they are clearly opposite, for example, one contact point is in the center, and one is in the periphery, any point in the circle(20) is opposite to any point in the periphery(22,18). The term opposite is defined as "directly facing each other," and the center point and periphery do face each other, Furthermore, there is a contact point on the underside of the chip at point 24 as disclosed in the '864 reference in column 3 line 10-20.

2.

The Office Action Has Failed To Establish
Correspondence To Claims 3~ 4 and 10.

As discussed above, the Office Action has failed to cite correspondence to limitations relevant to each claim, including those involving a lead frame with connectors having end portions within a perimeter of a frame. Generally, the cited "lead frame" does not have components that either extend freely or do so

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within a perimeter as claimed. As consistent with FIG. 5 above, the '864 reference does not disclose freely-extending end portions as asserted, as the asserted portions are coupled to carrier strips 30 and 32.

This point has been addressed above, the examiner again refers appellant to figure 1.

As further specific to claims 3, 4 and 10 and the rejection in the (final) Office Action, instead of explaining how the cited '864 reference corresponds to the amended limitations, the Examiner simply repeated Appellant's claim limitations and followed the repeated limitations with a vague citation to "Figures 1-5." Specifically, claim 3 (as amended) includes limitations directed to "first and second connection conductors respectively connected to a frame and having freely-extending end portions, the end portion of the second conductor being bent along a bending axis that is at an oblique angle with respect to a longitudinal axis of the end portion, and extending over the end portion of the first conductor." Claim 4 further recites that such end portions are within a frame. The Office Action has failed to establish correspondence to these limitations.

The appellant seems to have changed the claims denomination of what is the first conductor, with regards to the claim 3 the first conductor is now the conductor that is underneath the chip in the instant application. Fig. 1 of the '864 reference shows that there is a conductor underneath the chip, and after the product is complete, it is also freely extending as is clearly shown in fig. 1 and explained in column 3 lines 20-45, wherein the contact portion underneath the chip is arm 38.

3.

The Office Action Has Failed To Establish Correspondence To Claims 5 and 13 And Appears To Be Improperly Based Upon An "Obvious To Try" Assertion.

As discussed above, the Office Action has failed to cite correspondence to limitations relevant to each claim, including those involving a lead frame with connectors having end portions within a perimeter of a frame. The cited "lead frame" does not have components that either extend freely or do so within a perimeter as claimed.

In addition, the cited portions of the '864 reference also fail to provide correspondence to various method-based limitations in claim 5 (and relative to claim 13) directed to characterizing the bends of the connection conductors. For instance, respective portions of a lead frame are bent at 90 degrees along an out-of-plane bending axis, with an end of the conductor corresponding to the thickness of a semiconductor element again bent through 90 degrees. Regarding the Examiner's indicated confusion of the limitations in claim 13, Appellant notes the cited references similarly fail to disclose related limitations involving connection conductors bent along axes at oblique angles as claimed, with respective arrangements.

The Office Action's apparent attempt (see page 13) to address Appellant's traversals regarding these matters is further inappropriate because it amounts to an unsupported "Obvious to Try" assertion of what the cited conductors "would have to go through," without providing actual correspondence to these limitations (in violation of § 102, yet further failing to show motivation/suggestion under § 103). Such a

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rejection, has been reviewed and assessed adversely by the In re Kubin court which explains that the "obvious to try" standard may not be applied where one would have "to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful." In re Kubin (Fed. Cir. April 3, 2009), interpreting KSR. I See also M.P.E.P. § 2143(E), and Gillette Co. v. S.C. Johnson & Son, Inc., 919 F.2d 720, 725 (Fed. Cir. 1990). Here, while one of skill in the art could try a multitude of different manners in which to make a connection, nothing in the record supports the Examiner's conclusion that one of skill in the art would necessarily make a connection as claimed. This overly-broad thinking is exactly that which has been rejected by the In re Kubin Court as giving "either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful."

KSR Int'l Co. v. Teleflex, Inc., 550 U.S. 398 (U.S. 2007)

Accordingly, the § 102 rejection of claims 5 and 13 are also improper and should be removed.

The argument presented by the appellant is unclear, if the appellant is attempting to state that the connection conductor portion of the lead frame is not bent through 90 degrees, the examiner would like to bring attention to figures 4-5 of the '864 reference, the arms 72' and 60' in figure 4 are bent from approximately 0 degrees to approximately 160-170 degrees in order to reach and secure the semiconductor element, in order to go from 0 to 160 degrees, it would be necessary to go through 90 degrees because $90 < 160$, so to further simplify it, consider that on a protractor, in order to go from 0 to 160 degrees, one has to go through 1, 2, 3, 4,..., 90,..., 159 degrees.

C. The § 103 Rejections Are Improper Because The References Cannot Be Combined As Asserted~ And Teach Away From The Same.

The § 103 rejection of claims 8 and 14 is improper because the cited references teach away from the Office Action's proposed combination, as established by Appellant's traversals of record and uncontroverted in the Office Action. The Examiner's attempt to address this teaching away amounts to an unrelated argument about what claims 8 and 14 discuss, but fails to address Appellant's traversals identifying improprieties with the proposed combination of references, the impropriety of which is not dependent upon Appellant's claims.

Specifically, combining the references as asserted to arrive at the claimed invention would entail moving the member 30 as consistent with the Office Action. However, the '022 reference explicitly teaches away from such movement in teaching that member 30 is fixed in place. The proposed combination of references thus directly contradicts the purpose and teachings of the '022 reference. Consistent with the recent Supreme Court decision in KSR (cited above), M.P.E.P. § 2143.01 explains the long-standing principle that a § 103 rejection cannot be maintained when the asserted modification undermines either the operation or the purpose of the main reference - the rationale being that the prior art teaches away from such a modification. See KSR at 1742 ("[W]hen the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be non-obvious."). Under M.P.E.P. § 2143.01, the rejections should be reversed.

Claim 14 does not mention anything with regards to "moving a member". Claim 8 states that the semiconductor element is pushed by means of a pusher member, this argument was addressed in the final rejection wherein the examiner asserted that the reference clearly states that "fixing the flat member 30 on the bonding table without causing the bonding pad to deviate, bonding energy can be transferred to the bonding wire...", the

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word "push" is defined as "press against forcefully without moving", So according to the reference the member 30 would count as a "pusher member."

C.

The § 103 Rejections Are Improper Because The Cited References Do Not Correspond As Asserted.

As consistent with the above discussion of the impropriety of § 102(b) rejections, the § 103(a) rejection of claims 8 and 14 (which is also based upon the '864 reference) is improper because the Office Action has not established correspondence in the cited '864 reference, either alone or in combination with the '022 reference. None of the asserted references provides correspondence to a lead frame having non-engaging end portions that electrically connect to opposite sides of a semiconductor element, connection conductors that are located within an outer perimeter of a frame, and connectors that respectively freely extend in order to secure a semiconductor element.

The cited references further fail to provide correspondence to claims 8 and 14 as asserted, as the Office Action has (again) cited to multiple figures and discussion without providing an explanation as to which portions of the references discuss limitations (i. e., those directed to a hole and to a pusher member). Appellant has also reviewed the references for these limitations but cannot ascertain (operable) disclosure of these and other claim limitations. For instance, the cited portions of columns 8 and 9 of the '022 reference do not appear to discuss any pusher member or moving any semiconductor element, which is consistent with the Office Action's indication (see page 14) that "[t]he word "push" can be defined to "press against forcefully without moving." While Appellant appreciates the Examiner's definition, this definition fails to provide correspondence to claim limitations directed to pushing a semiconductor element "between the connection conductors" (i. e., by moving the element). Accordingly, neither reference discloses moving a semiconductor element with a pusher member as claimed, and the § 103 references should be reversed.

The examiner asserts that the claim language does not require the element to be moved in order to be pushed, a pusher member can push against the semiconductor element to hold it in place so that the vacuum suction holes(V) in the '022 reference can be engaged. There are many examples in which one element is pushing against another without moving it.

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

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Respectfully submitted,

/Swapneel Chhaya/

Examiner, Art Unit 2895

/N. Drew Richards/

Supervisory Patent Examiner, Art Unit 2895

Conferee:

/David S Martin/

Review Examiner, TC 2800